The Bureau Central Météorologique very kindly placed at my disposal the files of its Bulletin, which contains a great mass of accurate material that is very suggestive of the hypothesis when systematically arranged according to the above ideas.—*Jean Meunier.*

Hertzian waves should be observed and continuously recorded.—In November, 1911, the Observatoire Saint-Louis on the Isle of Jersey (Channel Isles) began to maintain a continuous record of electromagnetic waves of atmospheric origin. The recording device, called a *meteorondograph* (*Fr.*, météorondegraphe), involves a specially designed galvanometer which serves as a vibrating relay (relais-trembleur), and the observations are directed more toward determining the intensity rather than the frequency of the waves.

Observations have now been maintained through two complete years, and they permit us to recognize the existence of a normal hertzian field which, in common with all other atmospheric phenomena, is subject to laws of very constant, regular diurnal and annual variations; but it is also subject in common with the terrestrial magnetic field to sudden disturbances of great violence directly related to local or neighboring thunderstorms.

A comparative study at Tortosa, Spain, of observations bearing on the frequency of such waves, has shown that the hertzian field exists there also and shows the same character and law of variation that it does at Jersey.—*Marc Dechevrens.*

Thunderstorm of June 15, 1914 at Paris.—A torrential rainfall accompanied this storm between $17^h\ 40^m$ and $18^h\ 04^m$, giving 41 mm. in 24 minutes; there resulted serious damages to the "Métropolitain" [the Paris Underground] as well as injuries to persons.

The peculiarities of the storm as recorded at the Bureau Central Météorologique were described. The barogram showed a "squall hook" [2] and the wind vane made a complete circuit in the direction NW.–W. [anticlockwise] which is explained by the peculiar form of the barogram. The barometer located at the summit of the Eiffel Tower [not far from the Bureau Central Météorologique] did not record any such sudden change; an interesting relation, since it is in accord with the hypothesis which explains the sudden rise in pressure [causing the "squall hook"] as a dynamic effect produced by the descent of the air in the "squall zone".[3]—

THE GREEN FLASH AT SUNSET.[1]

By ALFRED W. PORTER.

[Dated: University College, London, Feb. 7, 1915.]

So much has been written about the green-ray at sunset that I am somewhat diffident about adding anything. But as I find myself unable to accept the orthodox explanation of the phenomenon usually seen, I write this note. This phenomenon, as seen by me on several occasions during the last summer on my way to Australia, always consisted in the last segment of the red sun before disappearance becoming a bright green (without any transition through intermediate tints); this green was, as nearly as could be judged, the complementary to the red of the sun itself. On one occasion I shut my eyes immediately the green tint appeared and it *remained visible.* There could be no doubt that what I saw was the purely subjective afterimage of the disappearing segment of the sun.

Of course if this is so it should be easy to set up a laboratory experiment to imitate the natural phenomenon; and on returning [to London] I asked Mr. E. Talbot Paris, research student in the Physical Department of this University, to arrange an experiment in illustration. An eccentric hole was made in a disk mounted on an axle. Red glass or gelatin film was fixed over the hole, and a bright light placed behind illuminated the film and produced thereby a miniature sun, which by slow rotation could be made to "set" behind an interposed card. At the exact instant of setting the artificial sun exhibited an exact reproduction of the phenomenon of the green ray. It was easily possible in this way to obtain a red ray using a green sun, or a blue ray with a yellow sun, and so on.

It is easy to give the rationale of the effect. The positive light gradually diminishes as the artificial sun passes below the horizon; and it only requires a little adjustment of the rate of disappearance in order that the negative afterimage excited at a previous instant when the segment was brighter shall overpower the simultaneous weaker positive image of the remaining segment itself.

It would not be fair for me to dogmatize and assert that this is the only phenomenon which comes under the head of the green ray. But it is certainly the only one which I succeeded in seeing; and *it must always be present even on the possible rarer occasions when color changes arising from dispersion are also evident.* It is certainly also what many others saw. At the same time it must also be added that the phenomenon as observed by different persons, even on the same night, was so variously described as to lead one to suppose that the subjective element is sometimes present to even a greater degree than is implied in the above note.

[The interested reader will find the green flash discussed briefly, as a phenomenon of refraction, by H. Schering in this REVIEW, September, 1905, **33**:408.—EDITOR.]

PERNTER AND EXNER ON THE GREEN FLASH.[1]

These authors describe the green-ray as having the color of the emerald, or about wave-length 530$\mu\mu$, and state that sometimes it has been reported to be of blue color. Of recent years it has been reported much more frequently than during the years previous to 1900, probably because more attention has been paid to this phenomenon. The "ray" or "flash" lasts but a few seconds, sometimes only a fraction of a second, and seems to be more frequently observed within than outside the Tropics.—C. A., jr.

The first explanations of the green ray referred it to the phenomena of optical atmospheric refraction which would cause the green, the blue, and the violet rays to be the last ones reaching the observer from the sun as it set below the horizon. Atmospheric extinction tends to blot out the most highly refracted waves—i. e., the blue and the violet—so that there remains a color mixture consisting of the more refrangible portion of the spectrum, viz, pre-

[1] *Reprinted from* Nature (London), Feb. 18, 1915, 94: 672.
[2] *See* Loisel, J. Squalls and thunderstorms. MONTHLY WEATHER REVIEW, June, 1909, 37: 239.
[3] Loisel, op. cit., p. 237.

[1] Pernter & Exner. Meteorologische Optik: IV. Abschnitt (Exner), Wien, 1910, p. 798–799.